CHARACTERIZATION OF RIPARIAN MANAGEMENT ZONES AND UPLAND MANAGEMENT AREAS WITH RESPECT TO WILDLIFE HABITAT

1988 FIELD REPORT

by

Chad Armour

TIMBER FISH
&WILDLIFE

April 20, 1989

1988 FIELD REPORT

CHARACTERIZATION OF RIPARIAN MANAGEMENT ZONES
AND UPLAND MANAGEMENT AREAS
WITH RESPECT TO WILDLIFE HABITAT

Submitted to:

Washington Department of Natural Resources
Division of Forest Regulation and Assistance
1007 S. Washington
Mail Stop EL-03
Olympia, WA 98504

Submitted by:

TFW
Wildlife Steering Committee
under the direction of the
Cooperative Monitoring, Evaluation, and Research Committee

Prepared by:

Chad Armour
TFW Biologist
Washington Department of Wildlife
Habitat Management Division
600 Capitol Way N.
Olympia, WA 98501-10!)1

April 20, 1989

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This project was designed to provide detailed information on Riparian Management Zones (RMZs) and Upland Management Areas (UMAs). The monitoring task to be completed was to quantify the physical and botanical characteristics of RMZs and UMAs with respect to wildlife habitat. This was the first year of a six-year study on state and private commercial forests in Washington. Sixty-four acres of RMZs located on 31 sites were sampled in 1988. Twenty-five RMZs were located on industrial land, four on private land, and two on state land. Thirty-six acres of UMAs located on eight sites were sampled in 1988. The structure of the UMAs sampled in 1988 was a diverse array of forest types ranging from wetlands to old-growth shrub/conifer boulder fields. Specific conclusions regarding the physical and botanical characteristics of RMZs and UMAs were not possible because of small sample size. Although the study plan was an excellent first approach to data collection, minor changes are recommended here to strengthen reliability of the results. These changes reflect information required by wildlife biologists to make management recommendations to forest practice foresters.

INTRODUCTION

The Timber/Fish/Wildlife (TFW) Agreement (1987) requires the development of a monitoring, evaluation, and research program with cooperative and collaborative decisions on priorities and associated costs. Results from research and monitoring will be used to make incremental changes in the forest practices regulations. This process is called adaptive management and is a policy of the Forest Practices Board.

Four broad, often interrelated topics for research and monitoring fall within the scope of TFW: riparian management zones (RMZ), upland management areas (UMA), critical wildlife habitats, and cumulative effects of forest practices. This project involves RMZs and UMAs.

RMZs are defined in the Forest Practice Regulations, WAC 222 (1988) as a specified area alongside Type 1, 2, and 3 waters where specific measures are taken to protect water quality and fish and wildlife habitat. Riparian zones are among the most heavily used wildlife habitats (Thomas et al., 1979) in the forested lands of Washington state. They occur along rivers, streams, intermittent drainages, ponds, lakes, reservoirs, springs, and wetlands.

UMAs are areas of naturally occurring trees and vegetation or where specific silvicultural activities have been designed for wildlife management (Forest Practices Regulations, 1988). UMAs are voluntary under the TFW agreement. They are intended to accommodate site-specific needs of landowners and wildlife. UMAs increase wildlife habitat diversity by providing conditions that would not normally occur in timber harvested areas, such as shelter, corridors for travel, and security for other wildlife activities associated with harvest areas. The TFW intent was that UMAs would provide increased diversity through irregular scattering or dispersion of habitats for a broad spectrum of wildlife species.

This project was designed to provide detailed information on RMZs and UMAs, but not an attempt to identify statistical or causal relationships between habitat and wildlife. It provides a necessary information base for determining effectiveness of the TFW process for riparian zone protection. The monitoring task to be completed by this project is to quantify the physical and botanical characteristics of RMZs and UMAs with respect to wildlife habitat. The hypothesis to be tested is:

- RMZs and UMAs can be characterized with respect to wildlife habitat.

This is the first year of a six year study.

STUDY AREA

The majority of commercial state and private forests in Washington are located in the Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) zones west of the Cascade Mountains. East of the Cascade Mountains they are located in the Douglas-fir (*Pseudotsuga menziesii*), Pacific silver fir (*Abies amabilis*), and subalpine fir (*Abies lasiocarpa*) zones.

This study was limited to state and private commercial forests in Washington. An excellent description of the physiography, geology, soils, and climate of this region was published by Franklin and Dyrness (1973).

METHODS

Procedures for quantifying RMZs and UMAs are detailed in the Field Procedures Handbook (Washington Department of Wildlife, 1988). Site selection was limited to areas harvested after January 1, 1988 and areas harvested prior to 1988 that satisfied the requirements of the TFW Agreement. Samples were stratified by landowner (Table 1) and Water Type to reflect harvest level activity.

Table 1. Ownership (in thousands of acres) of non-federal Washington commercial forests harvested in 1985 by DNR region and landowner.

REGION	LANDOWNER							
	Industrial		Private		State		Total	
	acres	%	acres	%	acres	%	acres	%
Northwest	12.3	35	18.0	51	4.8	14	35.1	100
Olympic	12.0	31	19.3	49	7.9	20	39.2	100
SPS	59.2	81	10.6	15	2.9	4	72.7	100
Central	86.8	67	37.8	29	5.0	4	129.6	100
Southwest	39.6	76	10.8	21	1.4	3	51.8	100
Southeast	40.4	76	7.4	14	5.5	10	53.3	100
Northeast	18.5	31	33.9	57	7.3	12	59.7	100
Total	268.8	61	137.8	31	34.8	8	441.4	100

A computer consulting company, Cousineau, Miller, and Associates, compiled and analyzed the data with SMART software (1986). Results are displayed in tabular form.

For each RMZ or UMA, a stereo pair of the most recent aerial photographs were filed together with the original field forms, area maps, and forest practice application. The location of each site was placed on 7.5 minute USGS quadrant map. Sites were located on 15 minute maps when 7.5 minute maps were unavailable. Maps and files are stored at the Department of Wildlife, Habitat Management Division, Olympia, Washington.

RESULTS

RMZs

Sixty-four acres of RMZs located on 31 sites (Figure 1) were sampled in 1988 (Table 2). RMZs were classified by water type. Over 12 acres of RMZs were sampled on Type 1 water, 18 acres on Type 2, and 33 acres on Type 3. On a few occasions, a portion of an RMZ was not sampled because of time limitations. No eastside Type 1 RMZs were sampled. Twenty-five RMZs were located on industrial land, four on private land, and two on state land.

RMZ widths on industrial land ranged from 42 to 56 feet and were remarkably consistent among water types (Table 3). On Type 3 water, RMZ width varied from 36 to 53 feet. Comparisons for private and state ownership and Types 1 and 2 water was difficult because of incomplete data and the small sample size.

Mean slope for westside RMZs on all water types ranged from 22 to 25 percent (Table 4). Mean slope for eastside RMZs was 13.5 percent for Type 3 water and 29 percent for Type 2.

RMZs were most often located in a canyon bottom or a broad flat (Table 5). RMZs were less frequently located on the lower third of a sidehill or on a bench or terrace.

Mean stream width was 32 feet for Type i water, 29 feet for Type 2, and 16 feet for Type 3 (Table 6). Mean stream depth, measured from the ordinary high water mark, was 1.6 feet for Type 1 water, 1.7 feet for Type 2, and 1.0 feet for Type 3. Mean stream gradient was 3.2, 1.9, and ,1.4 percent for Type 1, 2, and 3 water respectively.

The mean westside mid-channel overstory cover was similar for Type 1 and Type 3 water, but markedly different for Type 2 (Table 7). There was a noticeable difference in eastside mid-channel canopy coverage between Type 2 and 3 waters.

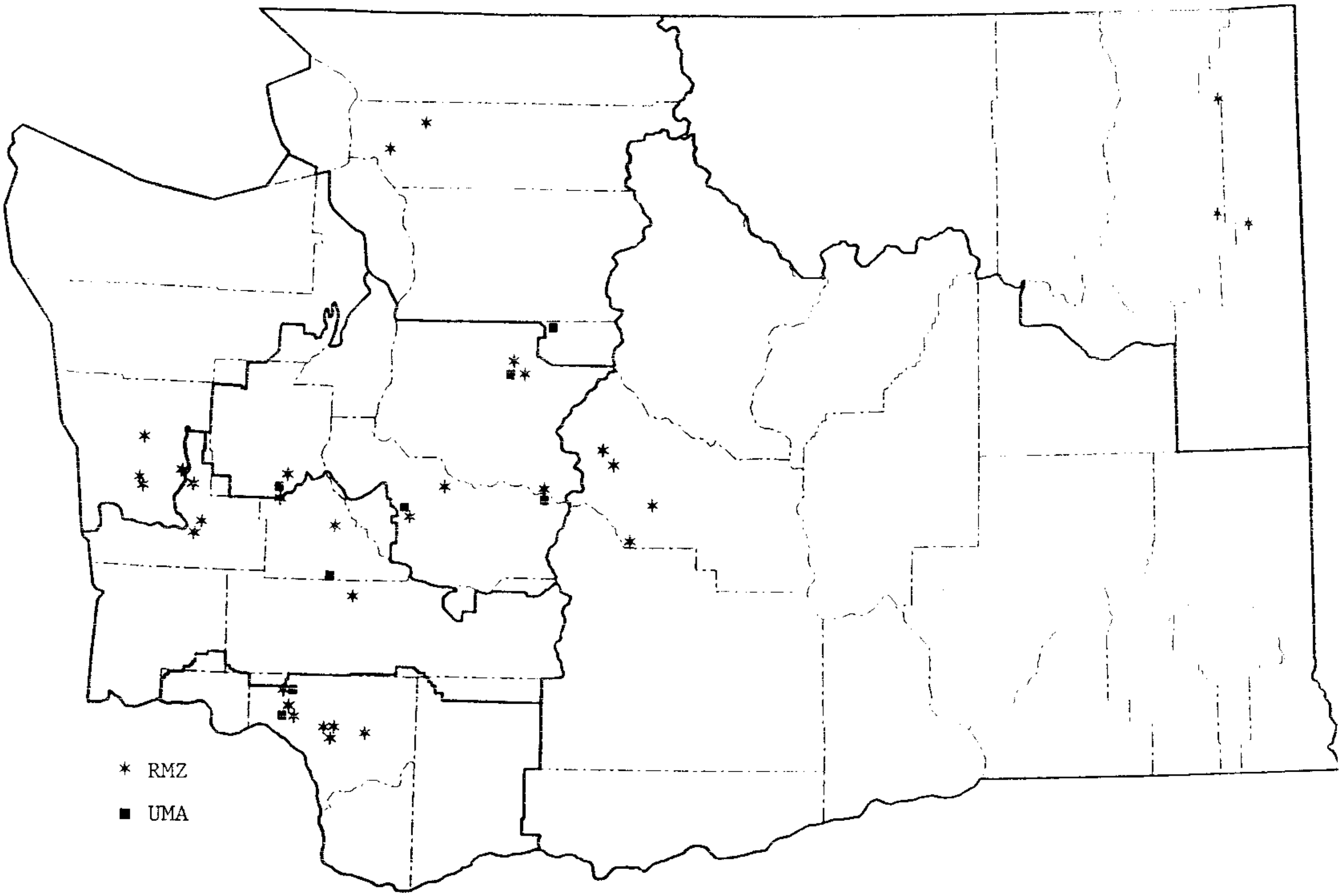

Figure 1. Location of sample RMZs and UMAs.

Table 2. Some important characteristics of RMZs sampled in 1988.

RMZ NUMBER	DNR REGION	OWNER CLASS	HARVEST UNIT SIZE (ac)	RMZ SIZE (ac)
TYPE 1 WATER				
009	SPS	Industrial	42.0	1.7
012	SW	Industrial	111.0	2.5
013	SW	Industrial	60.0	3.5
019	SW	Industrial	83.0	2.6
020	SPS	Industrial	110.0	1.8
Subtotal			406.0	12.1
TYPE 2 WATER				
005	CEN	Industrial	138.0	3.5
008	OLY	Industrial	295.0	3.2
021	SE	State	480.0	1.7
023	NE	Industrial	443.0	2.2
027	SPS	Industrial	62.0	1.5
033	CEN	Industrial	102.0	1.8
036	SPS	Industrial	69.0	2.7
038	SPS	Industrial	50.0	1.9
Subtotal			1639.0	18.4
TYPE 3 WATER				
001	CEN	Private	60.0	0.9
002	CEN	Industrial	128.0	1.4
003	OLY	Industrial	120.0	1.7
004	OLY	Industrial	110.0	2.2
007	OLY	Industrial	298.0	5.8
010	SW	Industrial	457.0	0.7
014	SE	Industrial	360.0	1.0
015	SE	Industrial	200.0	1.7
016	SW	Private	50.0	1.1
018	SW	State	83.0	1.7
022	NE	Private	44.0	0.8
024	NE	Industrial	360.0	4.2
025	SE	Industrial	205.0	2.7
028	SPS	Industrial	78.0	0.4
029	NW	Industrial	100.0	1.2
030	NW	Private	20.0	0.6
032	CEN	Industrial	40.0	2.5
035	SPS	Industrial	100.0	2.9
Subtotal			2813.0	33.4
Total			4858.0	64.0

Table 3. Mean RMZ width (in feet) by owner class and water type (n = number of RMZs).

OWNER CLASS	WATER TYPE								
	1			2			3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
Indust	55.6	13 - 210	5	50.7	0 - 220	7	41.9	0 - 260	13
Private	-	-	-	-	-	-	36.3	25 - 70	4
State	-	-	-	25.0	25 - 29	1	52.5	25 - 100	1

Table 4. Mean slope of RMZs (in percent) by water type (n = number of RMZs).

LOCATION	WATER TYPE								
	1			2			3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
WESTSIDE	21.6	12 - 33	5	24.3	7 - 81	6	25.1	6 - 54	16
EASTSIDE	-	-	-	29.0	13 - 45	2	13.5	11 - 16	2

Table 5. Distribution (in percent) of physiographic location of RMZs by water type (n = 31).

LOCATION	WATER TYPE		
	1	2	3
	Frequency	Frequency	Frequency
Sidehill (lower 1/3)	12	25	10
Canyon bottom	44	33	55
Bench or Terrace	-	9	-
Broad flat	44	33	35

Table 6. Mean width, depth, and gradient of streams by water type (n = number of strips).

VARIABLE	WATER TYPE								
	1			2			3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
Width (ft)	31.7	8 - 74	50	28.7	8 - 65	71	15.9	3 - 49	236
Depth (ft)	1.6	1 - 4	50	1.7	1 - 10	71	1.0	1 - 3	236
Gradient (%)	3.2	1 - 13	50	1.9	0 - 5	71	4.4	0 - 39	236

Table 7. Mean mid-channel overstory canopy cover (in percent) by water type (n = number of RMZs).

LOCATION	WATER TYPE								
	1			2			3		
	Cover	Range	n	Cover	Range	n	Cover	Range	n
WESTSIDE	79.6	64 - 96	5	32.0	0 - 95	6	74.8	32 - 95	16
EASTSIDE	-	-	-	20.5	0 - 41	2	86.0	85 - 87	2

Large Organic Debris (LOD)

The mean frequency of westside LOD ranged from 0 to 10 pieces/100 feet (Table 8), with gravel/cobble substrate showing greater frequency than boulder/bedrock. The mean frequency of LOD for the eastside gravel/cobble substrate was 2 pieces/100 feet for Type 2 water and 10 pieces/100 feet for Type 3 water.

The mean diameter of westside LOD was 16.0, 15.3, and 13.5 inches for Type 1, 2, and 3 water respectively (Table 9). Generally, the mean diameter of conifer LOD was larger than that of hardwood. The mean diameter of eastside LOD was 17.0 inches for Type 2 water and 10.9 inches for Type 3 water. Again, conifer LOD was larger than hardwood LOD.

The mean length of westside LOD ranged from 21.0 to 26.8 feet (Table 10). Apparently no one LOD type contributed longer pieces to the LOD component. The minimum length measured was 10 feet and the maximum 109 feet. The mean length of eastside LOD was similar between water types and ranged from 20.1 to 21.0 feet. conifer LOD was longer than either hardwood or unknown LOD. The maximum length for eastside LOD was 65 feet.

Vegetation and Other Strip Variables

Cover and constancy - where constancy is defined as the degree of presence - of vegetation were remarkably similar for westside and eastside RMZs (Table 11). The major difference was that westside RMZs had more shrubs and less graminiods than eastside RMZs.

The mean density of trees in westside RMZs was 51.0 trees/acre for Type 1 water (Table 12), 114.8 trees/acre for Type 2 (Table 13), and 234.2 trees/acre for Type 3 (Table 14). Hardwoods dominated Type 1 water, conifers dominated Type 3, and hardwoods and conifers were codominant in Type 2. Most of the trees were in the smaller size categories.

In eastside RMZs density was 113.6 trees/acre for Type 2 water (Table 15) and 80.4 trees/acre for Type 3 (Table 16). Conifers dominated Type 3 water and were codominant with hardwoods on Type 2 Like westside RMZs, most of the trees were in the smaller size categories.

Table 8. Mean frequency (pieces/100ft) of LOD by substrate and water type (n = number of RMZs).

SUBSTRATE	WATER TYPE 1			WATER TYPE 2			WATER TYPE 3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
WESTSIDE									
Gravel/Cobble	9.3	9 - 10	2	4.2	0 - 11	5	10.2	8 - 15	13
Boulder/Bedrock	8.1	3 - 16	3	0.0	0 - 0	1	5.4	5 - 6	3
EASTSIDE									
Gravel/Cobble	-	-	-	2.0	0 - 4	2	10.0	10 - 10	2
Boulder/Bedrock	-	-	-	-	-	-	-	-	-

Table 9. Mean diameter of LOD (in inches) by LOD type and water type (n = pieces of LOD).

LOD TYPE	WATER TYPE 1			WATER TYPE 2			WATER TYPE 3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
WESTSIDE									
Hardwood	11.1	4 - 40	82	9.8	4 - 16	13	8.8	4 - 64	84
Conifer	22.4	4 - 72	68	23.5	5 - 46	19	18.4	4 - 84	269
Unknown	14.4	4 - 36	64	12.6	4 - 26	74	13.4	4 - 99	388
Total	16.0	4 - 72	214	15.3	4 - 46	106	13.5	4 - 99	741
EASTSIDE									
Hardwood	-	-	-	11.0	8 - 18	5	5.5	4 - 8	6
Conifer	-	-	-	20.7	8 - 30	6	15.6	4 - 48	24
Unknown	-	-	-	19.3	6 - 31	9	11.9	4 - 42	69
Total	-	-	-	17.0	6 - 31	20	11.0	4 - 48	100

Table 10. Mean length of LOD (in feet) by LOD type and water type (n = pieces of LOD).

LOD TYPE	WATER TYPE 1			WATER TYPE 2			WATER TYPE 3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
WESTSIDE									
Hardwood	24.3	10 - 73	82	43.6	20 - 69	13	23.7	10 - 68	84
Conifer	29.6	10 - 109	68	20.6	10 - 41	19	22.7	10 - 80	269
Unknown	21.2	10 - 60	64	16.1	10 - 55	74	16.6	10 - 50	387
Total	25.0	10 - 109	214	26.8	10 - 69	106	21.0	10 - 80	740
EASTSIDE									
Hardwood	-	-	-	17.6	15 - 20	5	17.3	10 - 32	7
Conifer	-	-	-	28.5	10 - 60	6	25.3	10 - 65	24
Unknown	-	-	-	17.0	10 - 30	9	17.6	10 - 42	69
Total	-	-	-	21.0	10 - 60	20	20.1	10 - 65	100

Table 11. Mean cover, constancy, and range of vegetation in RMZs by life form and water type. (n = 31).

LIFE FORM	WATER TYPE								
	1			2			3		
	Cover	Const	Range	Cover	Const	Range	Cover	Const	Range
WESTSIDE									
Trees	86.8	100	3 - 99	86.6	100	15 - 99	74.9	100	3 - 99
Shrubs	64.5	99	0 - 98	70.8	98	0 - 98	54.8	94	0 - 98
Forbs	51.3	99	0 - 98	36.8	93	0 - 98	39.7	94	0 - 98
Graminoids	7.2	48	0 - 98	12.6	47	0 - 98	6.1	40	0 - 98
EASTSIDE									
Trees	-	-	-	74.0	100	2 - 99	87.1	100	29 - 99
Shrubs	-	-	-	41.2	88	0 - 98	43.6	92	0 - 98
Forbs	-	-	-	17.5	93	0 - 98	56.0	99	0 - 98
Graminoids	-	-	-	21.2	66	0 - 98	38.6	90	0 - 98

Table 12. Mean density of trees (stems/acre) in westside RMZs by species and size class on Type 1 Water (n = 5).

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
big leaf maple	0.6	2.7	2.4	3.2	2.9	1.1	1.2	14.1
black cottonwood	---	0.6	---	---	---	---	---	0.6
red alder	1.6	4.1	5.7	6.6	2.7	1.1	0.5	22.3
all other hardwoods	1.5	2.5	0.6	---	---	---	---	4.6
Total Hardwoods	3.7	9.9	8.7	9.8	5.6	2.2	1.7	41.6
Douglas-fir	---	---	0.6	---	0.5	0.8	0.7	2.6
western hemlock	---	0.4	---	0.4	---	---	0.4	1.2
western redcedar	1.1	0.8	0.9	0.5	0.6	1.1	0.6	5.6
Total Conifers	1.1	1.2	1.5	0.9	1.1	1.9	1.7	9.4
Total Trees	4.8	11.1	10.2	10.7	6.7	4.1	3.4	51.0

Table 13. Mean density of trees (stems/acre) in westside RMZs by species and size class on Type 2 Water (n = 6).

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
big leaf maple	---	0.4	0.4	0.9	1.1	---	0.4	3.2
red alder	3.0	9.2	9.3	7.4	4.0	1.1	1.0	35.0
all other hardwoods	6.5	4.5	0.7	0.3	---	---	---	12.0
Total Hardwoods	9.5	14.1	10.4	8.6	5.1	1.1	1.4	50.2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pacific yew	2.0	3.1	1.1	0.5	---	---	---	6.7
Sitka spruce	---	0.7	0.6	---	0.3	---	0.3	1.9
western hemlock	1.2	2.4	4.5	3.2	4.5	2.5	1.3	19.6
western red cedar	2.0	1.8	0.8	1.1	2.0	0.6	0.6	8.9
Total Conifers	9.6	16.3	14.5	8.6	7.9	3.7	4.0	64.6
Total Trees	19.1	30.4	24.9	17.2	13.0	4.8	5.4	114.8

Table 14. Mean density of trees (stems/acre) in westside RMZs by species and size class on Type 3 Water (n = 16)

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
big leaf maple	1.7	0.6	1.5	1.3	0.8	1.2	---	7.1
bitter cherry	---	---	8.3	---	---	---	---	8.3
black cottonwood	---	---	---	---	0.8	0.8	1.7	3.3
red alder	4.3	18.7	13.8	9.8	4.7	2.0	1.4	54.7
all other hardwoods	3.0	1.9	0.7	0.8	---	---	---	6.4
Total Hardwoods	9.0	21.2	24.3	11.9	6.3	4.0	3.1	79.8
Douglas-fir	---	1.8	1.7	1.4	1.2	0.8	1.8	8.7
Engleman spruce	---	1.1	0.4	---	1.4	1.1	1.1	5.1
grand fir	0.9	6.2	3.4	2.0	4.7	0.5	1.2	18.9
mountain hemlock	1.2	7.1	4.1	1.8	0.6	0.6	---	15.4
Pacific silver fir	4.9	17.6	7.3	3.4	2.8	3.5	0.6	40.1
Pacific yew	2.9	1.4	---	---	---	---	---	4.3
Sitka spruce	0.6	1.7	0.7	0.8	---	---	2.4	6.2
subalpine fir	0.5	1.2	1.5	0.6	0.7	---	---	4.5
western hemlock	5.2	7.9	4.0	3.6	1.0	1.0	1.4	24.1
western redcedar	1.9	4.6	6.2	2.8	2.6	3.0	5.4	26.5
western white pine	0.6	---	---	---	---	---	---	0.6

Table 15. Mean density of trees (stems/acre) in eastside RMZs by species and size class on Type 2 Water (n = 2).

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
black cottonwood	---	1.8	1.2	1.8	---	---	0.6	5.4
western paper birch	0.5	2.3	2.3	---	---	---	---	5.1
all other hardwoods	15.6	27.8	5.3	0.6	---	---	---	49.3
Total Hardwoods	16.1	31.9	8.8	2.4	---	---	0.6	59.8
Douglas-fir		1.6	1.4	0.9	2.9	---	0.6	7.4
grand fir	1.7	4.5	1.8	1.8	0.9	1.3	0.6	12.6
ponderosa pine	---	---	1.2	1.8	1.8	---	0.6	5.4
subalpine fir	---	0.5	0.5	---	0.5	---	---	1.5
western hemlock	---	1.8	1.4	0.5	---	---	---	3.7
western larch	---	0.5	---	---	---	---	---	0.5
western redcedar	5.9	8.6	4.1	2.7	1.4	---	---	22.7
Total Conifers	7.6	17.5	10.4	7.7	7.5	1.3	1.8	53.8
Total Trees	23.7	49.4	19.2	10.1	7.5	1.3	2.4	113.6

Table 16. Mean density of trees (stems/acre) in eastside RMZs by species and size class on Type 3 Water (n = 2).

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
all other hardwoods	6.2	8.4	1.4	---	---	---	---	16.0
Total Hardwoods	6.2	8.4	1.4	---	---	---	---	16.0
Alaska yellow cedar	0.2	---	---	---	---	---	---	0.2
Douglas-fir	---	1.3	0.2	2.5	1.3	---	---	5.3
Engleman spruce	2.0	0.9	1.3	1.3	0.8	0.2	---	6.5
grand fir	---	0.7	0.7	0.7	---	---	---	2.1
lodgepole pine	---	---	---	---	1.3	---	---	1.3
Pacific yew	---	1.0	---	---	---	---	---	1.0
subalpine fir	6.3	7.5	---	1.3	2.5	---	1.3	18.9
western hemlock	0.7	1.7	1.4	0.2	0.2	---	---	4.2
western larch	---	---	---	1.3	1.3	1.3	1.3	5.2
western redcedar	2.6	5.4	5.7	2.2	1.9	1.2	0.7	19.7
Total Conifers	11.6	18.5	9.3	9.5	9.3	2.7	3.3	64.4
Total Trees	17.8	26.9	10.7	9.5	9.3	2.7	3.3	80.4

The mean density of snags in westside RMZs was 13.7 snags/acre for Type 1 water (Table 17), 38.3 snags/acre for Type 2 (Table 18), and 64.0 snags/acre for Type 3 (Table 19). Hardwood snags dominated Type 1 water. Hardwood and conifer snags were codominant in Type 2 and 3 water. Again, :most of the snags were in the smaller size categories.

The mean density of snags in eastside RMZs was 20.0 snags/acre for Type 2 water (Table 20) and 10.9 snags/acre for Type 3 (Table 21). Conifer snags dominated Type 2 water. Hardwood and conifer snags were codominant in Type 3. Most of the snags were in the smaller size categories.

Salmonberry (Rubus spectabilis), vine maple (Acer circinatum), salal (Gautheria shallon), and red-osier dogwood (Cornus stolonifera) were the shrub species most often encountered in westside RMZs (Table 22). The dominant shrub species in Type 1 water was red-osier dogwood (91% cover), with salmonberry dominant on Type 2 and Type 3 waters (49% and 30% cover, respectively).

In eastside RMZs, common shrub species were alder (Alnus spp.), willow (Salix spp.), snowberry (Symphoricarpos albus), and red-osier dogwood (Table 23). The dominant shrub in Types 2 and 3 waters was alder (70% and 53% cover, respectively).

Mean organic ground cover (OGC) on the westside ranged from 78 to 88 percent (Table 24). Mean cover for water, rock, and soil ranged from 0.3 to 5 percent. On the eastside mean OGC ranged from 75 to 90 percent, with water, rock, and soil ranging from 0 to 11 percent.

Mean cover for downed woody material ranged from 8 to 12 percent on the westside and from 4 to 8 percent on the eastside (Table 25).

Table 17. Mean density of snags (stems/acre) in westside RMZs by snag class and size class on Type 1 Water (n = 5).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	---	0.4	---	0.6	---	---	---	1.0
Live - top broken out	---	---	0.4	0.4	0.6	---	---	1.4
Live - dead top	---	0.8	---	---	---	---	---	0.8
Older dead - bark tight	---	0.9	0.6	0.6	---	---	---	2.1
Older dead - no bark	0.7	1.5	1.1	1.0	---	---	---	4.3
Total Hardwoods	0.7	3.6	2.1	2.6	0.6	---	---	9.6
CONIFERS								
Recent dead	---	---	---	---	---	---	---	---
Live - top broken out	---	---	---	0.4	---	---	---	0.4
Live - dead top	0.3	---	0.8	---	---	---	---	1.1
Older dead - bark tight	---	0.6	0.6	---	---	---	---	1.2
Older dead - no bark	---	---	0.4	---	0.4	0.6	---	1.4
Total Conifers	0.3	0.6	1.8	0.4	0.4	0.6	---	4.1
Total Snags	1.0	4.2	3.9	3.0	1.0	0.6	---	13.7

Table 18. Mean density of snags (stems/acre) in westside RMZs by snag class and size class on Type 2 Water (n = 6).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	0.3	0.6	1.0	0.5	---	---	---	2.4
Live - top broken out	0.3	---	0.3	0.6	0.3	---	---	1.5
Live - dead top	---	0.4	0.3	0.4	0.3	---	---	1.4
Older dead - bark tight	0.7	2.6	0.8	0.6	---	---	---	4.7
Older dead - no bark	1.3	2.1	1.5	0.6	0.9	0.4	---	6.8
Total Hardwoods	2.6	5.7	3.9	2.7	1.5	0.4	---	16.8
CONIFERS								
Recent dead	---	1.1	0.7	0.4	0.4	---	---	2.6
Live - top broken out	---	1.0	---	0.5	0.3	---	0.5	2.3
Live - dead top	---	1.1	1.1	0.4	---	0.5	---	3.1
Older dead - bark tight	1.7	1.2	1.1	0.5	0.5	---	0.4	5.4
Older dead - no bark	0.7	2.5	1.8	0.9	0.9	0.4	0.9	8.1
Total Conifers	2.4	6.9	4.7	2.7	2.1	0.9	1.8	21.5
Total Snags	5.0	12.6	8.6	5.4	3.6	1.3	1.8	38.3

Table 19. Mean density of snags (stems/acre) in westside RMZs by snag class and size class on Type 3 Water (n = 16).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	1.1	1.7	0.9	1.0	---	---	---	4.7
Live - top broken out	0.4	0.7	1.1	0.9	---	---	---	3.1
Live - dead top	0.9	1.1	0.7	---	0.9	---	---	3.6
Older dead - bark tight	2.5	1.5	0.6	0.7	---	---	---	5.3
Older dead - no bark	2.3	4.2	2.5	1.4	0.9	0.4	0.5	12.2
Total Hardwoods	7.2	9.2	5.8	4.0	1.8	0.4	0.5	28.9
CONIFERS								
Recent dead	0.7	1.1	0.8	0.5	1.1	1.1	---	5.3
Live - top broken out	---	0.8	1.0	---	0.6	1.0	1.2	4.6
Live - dead top	2.5	0.8	0.7	---	0.6	---	---	4.6
Older dead - bark tight	0.6	1.2	0.9	0.6	0.4	0.8	0.8	5.3
Older dead - no bark	1.8	2.3	2.3	5.4	1.4	0.9	1.2	15.3
Total Conifers	5.6	6.2	5.7	6.5	4.1	3.8	3.2	35.1
Total Snags	12.8	15.4	11.5	10.5	5.9	4.2	3.7	64.0

Table 20. Mean density of snags (stems/acre) in eastside RMZs by snag class and size class on Type 2 Water (n = 2).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	---	---	---	---	---	---	---	---
Live - top broken out	---	0.9	---	---	---	---	---	0.9
Live - dead top	---	---	---	---	---	---	---	---
Older dead - bark tight	2.9	1.9	0.6	---	---	---	---	5.4
Older dead - no bark	---	0.6	0.6	---	---	---	---	1.2
Total Hardwoods	2.9	3.4	1.2	---	---	---	---	7.5
CONIFERS								
Recent dead	0.5	0.5	0.5	0.5	---	---	---	2.0
Live - top broken out	---	1.8	0.5	---	---	---	---	2.3
Live - dead top	---	---	0.5	0.6	---	---	---	1.1
Older dead - bark tight	0.5	1.2	1.1	---	---	---	---	2.8
Older dead - no bark	---	2.2	0.9	0.6	---	---	0.6	4.3
Total Conifers	1.0	5.7	3.5	1.7	---	---	0.6	12.5
Total Snags	3.9	9.1	4.7	1.7	---	---	0.6	20.0

Table 21. Mean density of snags (stems/acre) in eastside RMZs by snag class and size class on Type 3 Water (n = 2).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	---	0.2	---	---	---	---	---	0.2
Live - top broken out	---	0.5	---	---	---	---	---	0.5
Live - dead top	---	---	---	---	---	---	---	---
Older dead - bark tight	1.2	1.2	---	---	---	---	---	2.4
Older dead - no bark	1.2	1.0	---	---	---	---	---	2.2
Total Hardwoods	2.4	2.9	---	---	---	---	---	5.3
CONIFERS								
Recent dead	---	---	---	---	---	---	---	---
Live - top broken out	---	0.7	---	---	---	0.2	---	0.9
Live - dead top	---	---	---	---	---	---	---	---
Older dead - bark tight	0.9	1.9	---	---	---	---	---	2.8
Older dead - no bark	---	0.5	0.5	---	---	0.2	0.7	1.9
Total Conifers	0.9	3.1	0.5	---	---	0.4	0.7	5.6
Total Snags	3.3	6.0	0.5	---	---	0.4	0.7	10.9

Table 22. Mean cover, constancy, and range of the dominant shrub in westside RMZs by water type (n = 27).

SHRUB	WATER TYPE 1			WATER TYPE 2			WATER TYPE 3		
	Cover	Const	Range	Cover	Const	Range	Cover	Const	Range
vine maple	70.9	27	3 - 98	68.8	7	3 - 98	56.5	17	3 - 98
Douglas maple	-	-	- -	-	-	- -	53.7	+	38 - 85
alder species	-	-	- -	-	-	- -	76.4	4	3 - 98
serviceberry	-	-	- -	-	-	- -	74.0	+	63 - 85
Cascade Oregon grape	26.8	1	16 - 38	40.3	5	3 - 85	6.8	1	3 - 16
red-osier dogwood	91.4	9	63 - 98	85.0	+	85 - 85	-	-	- -
hazelnut	30.5	1	16 - 38	38.0	+	38 - 38	2.5	+	3 - 3
salal	26.8	1	16 - 38	62.1	11	0 98	55.2	9	3 - 98
ocean spray	15.5	+	16 - 16	29.7	2	3 - 85	23.5	+	3 - 38
rusty menziesia	-	-	- -	2.5	+	3 - 3	43.5	2	16 - 85
Indian plum	21.9	2	16 - 38	15.5	+	16 - 16	38.0	+	38 - 38
devil's club	24.2	2	3 - 85	55.4	5	3 - 98	37.6	6	3 - 98
pachistima	-	-	- -	26.8	1	16 - 38	11.4	+	3 - 38
ninebark	74.0	1	63 - 85	-	-	- -	-	-	- -
cascara	98.0	+	98 - 98	76.3	2	16 - 98	68.4	2	16 - 98
prickly current	-	-	- -	-	-	- -	18.9	3	3 - 63
baldhip rose	15.5	+	16 - 16	2.5	+	3 - 3	6.8	1	3 - 16
rose species	-	-	- -	9.0	1	3 - 16	-	-	- -
salmonberry	46.2	44	3 - 98	74.6	49	3 - 98	57.2	30	3 - 98
thimbleberry	-	-	- -	2.5	+	3 - 3	46.5	2	3 - 85
trailing blackberry	48.6	2	16 - 85	36.7	7	3 - 85	42.2	3	3 - 98
willow species	64.8	1	38 - 98	63.0	+	63 - 63	92.1	2	63 - 98
red elderberry	29.9	3	16 - 63	9.0	1	3 - 16	33.8	2	3 - 85
mountain ash	-	-	- -	-	-	- -	26.8	+	16 - 38
shiney leaf spiraea	-	-	- -	85.0	+	85 - 85	15.5	+	16 - 16
hardhack	-	-	- -	51.5	2	16 - 85	-	-	- -
common snowberry	38.0	+	38 - 38	26.8	1	16 - 38	11.2	+	3 - 16
huckleberry species	-	-	- -	-	-	- -	20.3	+	3 - 38
big huckleberry	-	-	- -	26.8	1	16 - 38	23.6	5	3 - 98
red huckleberry	29.8	1	3 - 63	23.7	6	3 - 63	15.6	2	3 - 63
stink current	41.1	3	16 - 85	-	-	- -	34.9	7	3 - 98
unknown	26.8	1	16 - 38	63.0	+	63 - 63	46.6	1	16 - 85
bigleaf maple	-	-	- -	-	-	- -	38.0	+	38 - 38
blackberry species	-	-	- -	-	-	- -	50.5	+	38 - 63
grouse huckleberry	-	-	- -	-	-	- -	9.0	+	3 - 16
wax current	-	-	- -	-	-	- -	2.5	+	3 - 3

+ = rare

Table 23. Mean cover, constancy, and range of dominant shrubs in eastside RMZs by water type (n =4).

SHRUB	WATER TYPE								
	1			2			3		
	Cover	Const	Range	Cover	Const	Range	Cover	Const	Range
[redacted]									
alder species	-	-	-	70.1	8	38 - 98	52.7	56	3 - 98
Cascade Oregon grape	-	-	-	2.5	1	3 - 3	-	-	-
Oregon grape	-	-	-	-	-	-	2.5	3	3 - 3
red-osier dogwood	-	-	-	67.3	13	3 - 98	32.0	11	3 - 63
hazelnut	-	-	-	-	-	-	2.5	3	3 - 3
salal	-	-	-	-	-	-	2.5	3	3 - 3
ocean spray	-	-	-	25.0	6	3 - 63	-	-	-
ninebark	-	-	-	46.3	6	38 - 63	-	-	-
prickly current	-	-	-	-	-	-	9.0	2	3 - 16
baldhip rose	-	-	-	16.7	5	3 - 38	2.5	4	3 - 3
rose species	-	-	-	9.0	4	3 - 16	-	-	-
thimbleberry	-	-	-	17.9	4	3 - 38	2.5	1	3 - 3
willow species	-	-	-	21.1	16	3 - 98	-	-	-
shiney leaf spiraea	-	-	-	-	-	-	15.5	1	16 - 16
hardhack	-	-	-	15.5	3	16 - 16	-	-	-

Table 24. Mean cover, constancy, and range of water, rock, soil, and organic ground cover (OGC) in RMZs by water type (n = 31).

VARIABLE	WATER TYPE 1			WATER TYPE 2			WATER TYPE 3		
	Cover	Const	Range	Cover	Const	Range	Cover	Const	Range
WESTSIDE									
Water	0.6	5	0 - 63	0.3	5	0 - 38	0.6	6	0 - 63
Rock	5.0	24	0 - 98	2.1	8	0 - 98	1.8	17	0 - 98
Soil	2.6	37	0 - 38	2.3	17	0 - 98	3.4	26	0 - 98
OGC	77.7	99	0 - 98	87.7	99	0 - 98	83.3	100	0 - 98
EASTSIDE									
Water	-	-	-	+	1	0 - 3	1.3	15	0 - 63
Rock	-	-	-	11.3	46	0 - 98	+	2	0 - 3
Soil	-	-	-	8.3	49	0 - 98	0.9	23	0 - 16
OGC	-	-	-	75.2	99	0 - 98	90.4	100	16 - 98

+ = trace

Table 25. Mean cover, constancy, and range of downed woody material > 4in. in diameter in RMZs by decay class and water type (n = 31).

DECAY CLASS	WATER TYPE 1			WATER TYPE 2			WATER TYPE 3		
	Cover	Const	Range	Cover	Const	Range	Cover	Const	Range
WESTSIDE									
1	1.3	16	0 - 38	1.1	13	0 - 38	2.9	28	0 - 85
2	5.4	31	0 - 98	1.3	17	0 - 38	3.2	25	0 - 98
3	3.6	30	0 - 85	5.4	39	0 - 85	5.8	37	0 - 85
Total	10.3	-	0 - 98	7.8	-	0 - 85	11.9	-	0 - 98
EASTSIDE									
1	-	-	-	1.6	22	0 - 16	2.1	28	0 - 16
2	-	-	-	0.9	17	0 - 16	2.2	31	0 - 38
3	-	-	-	1.8	16	0 - 38	3.2	38	0 - 38
Total	-	-	-	4.3	-	0 - 38	7.5	-	0 - 38

UMas

Thirty-six acres of UMAs located on eight sites (Figure 1) were sampled in 1988 (Table 26). UMAs were classified by their position relative to RMZs. Over six acres of UMAs attached to RMZs and 29 acres of UMAs unattached to RMZs were sampled. Often only a portion of the UMAs were sampled because of time or safety constraints. No eastside UMAs were sampled in 1988. Seven of eight UMAs sampled were owned by industry. One was owned by a small private landowner. The structure of the UMAs sampled in 1988 was a diverse array of forest types and ranged from wetlands to old-growth shrub/conifer boulder fields.

Table 26. Some important characteristics of UMAs sampled in 1988.

UMA NUMBER	DNR REGION	OWNER CLASS	HARVEST UNIT SIZE(ac)	UMA SIZE (ac)	UMA SIZE SAMPLED (ac)	DESCRIPTION
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The mean slope of UMAs attached to RMZs was 42 percent: (Table 27). The mean slope of UMAs unattached to RMZs was 21 percent.

UMAs attached to RMZs were most often located in canyon bottoms (Table 28), whereas UMAs unattached to RMZs were widely distributed from broad flats to flat ridgetops and everything in between.

Table 27. Mean slope (in percent) of UMAs by position relative to RMZs (n = number of UMAs).

LOCATION	POSITION					
	Attached to RMZs			Unattached to RMZs		
	Mean	Range	n	Mean	Range	n
WESTSIDE	41.5	6 - 77	2	20.8	1 - 74	6

Table 28. Distribution (in percent) of physiographic location of UMAs by position relative to RMZs (n = 8).

LOCATION	POSITION	
	Attached to RMZs	Unattached to RMZ
	Frequency	Frequency
Sharp ridgetop	-	-
Flat ridgetop	-	22
Slidehill (upper 1/3)	-	22
Slidehill (middle 1/3)	25	22
Slidehill (lower 1/3)	-	11
Canyon bottom	50	-
Bench or Terrace	-	11
Broad flat	25	11

Table 29. Mean cover, constancy, and range of vegetation in UMAs by life form and position relative to RMZs (n = 8).

LIFEFORM	POSITION	
	Attached to RMZs	Unattached to RMZs

Vegetation and Other Strip Variables

Cover and constancy of trees and shrubs were similar between attached and unattached UMAs (Table 29). Cover and constancy of forbs and graminiods, however, were greater for attached UMAs than unattached UMAs.

The mean density of trees in westside UMAs was 81.4 trees/acre for attached UMAs (Table 30) and 113.4 trees/acre for unattached UMAs (Table 31). Hardwoods dominated attached UMAs. Hardwoods and conifers codominated unattached UMAs. Most of the trees were in the smaller size categories.

Density of snags in westside UMAs was 13.8 snags/acre for UMAs attached to RMZs (Table 32) and 26.3 snags/acre for unattached UMAs (Table 33). Conifer snags dominated both types of UMAs. Most of the snags were in the smaller size categories.

Vine maple, trailing blackberry (Rubus ursinus), red-osier dogwood, salmonberry, and red huckleberry (Vaccinium parvifolium) were the shrub species most often encountered in westside UMAs (Table 34). The dominant shrub in attached UMAs was red-osier dogwood (87% cover), with trailing blackberry (73% cover) dominant in unattached UMAs.

Mean OGC of the westside was 88 percent for attached UMAs and 87 percent for unattached UMAs (Table 35). Water, rock, and soil cover ranged from less than 1 percent to 14 percent.

Mean cover for downed woody material in westside UMAs was 5 and 6 percent for attached and unattached UMAs, respectively (Table 36).

Table 30. Mean density of trees (stems/acre) in westside UMAs attached to RMZs by species and size class (n = 2).

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
big leaf maple	0.6	3.3	4.1	3.1	1.3	1.3	2.5	16.2
black cottonwood	---	1.0	---	---	---	---	---	1.0
red alder	10.8	15.8	2.1	2.5	---	0.3	---	31.5
all other hardwoods	1.1	0.3	1.6	0.3	---	0.6	---	3.9
Total Hardwoods	12.5	20.4	7.8	5.9	1.3	2.2	2.5	52.6
Douglas-fir	2.0	0.7	0.8	0.5	0.7	2.0	0.7	7.4
Pacific yew	0.3	0.7	---	---	---	---	---	1.0
western hemlock	0.7	3.3	1.0	1.3	0.5	1.0	0.3	8.1
western redcedar	0.3	2.2	1.6	2.5	1.3	0.3	4.1	12.3
Total Conifers	3.3	6.9	3.4	4.3	2.5	3.3	5.1	28.8
Total Trees	15.8	27.3	11.2	10.2	3.8	5.5	7.6	81.4

Table 31. Mean density of trees (stems/acre) in westside UMAs unattached to RMZs by species and size class (n = 6).

SPECIES	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
big leaf maple	0.5	0.7	0.8	0.3	---	0.3	---	2.6
bitter cherry	---	0.5	1.8	0.2	---	---	---	2.5
red alder	10.9	27.1	8.6	3.4	0.8	0.5	0.3	51.6
all other hardwoods	1.0	2.2	0.8	---	---	---	---	4.0
Total Hardwoods	12.4	30.5	12.0	3.9	0.8	0.8	0.3	60.7
Douglas-fir	2.2	13.0	4.5	2.7	1.8	0.6	0.5	25.3
grand fir	0.1	---	---	---	---	---	---	0.1
mountain hemlock	---	0.3	0.3	0.1	0.2	0.2	0.2	1.3
Pacific silver fir	0.3	1.1	0.6	0.4	0.2	---	0.3	2.9
Sitka spruce	0.5	1.0	1.5	1.5	1.0	---	---	5.5
subalpine fir	---	---	0.1	0.1	---	---	---	0.2
western hemlock	0.6	1.5	1.2	1.6	0.5	0.4	0.6	6.4
western redcedar	2.0	4.5	2.2	0.8	---	0.5	1.0	11.0
Total Conifers	5.7	21.4	10.4	7.2	3.7	1.7	2.6	52.7
Total Trees	18.1	51.9	22.4	11.1	4.5	2.5	2.9	113.4

Table 32. Mean density of snags (stems/acre) in westside UMAs attached to RMZs by snag class and size class (n = 2).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	0.3	0.3	---	---	---	---	---	0.6
Live - top broken out	0.3	0.6	---	---	---	---	---	0.9
Live - dead top	---	0.3	---	---	---	---	---	0.3
Older dead - bark tight	---	0.9	---	---	---	---	---	0.9
Older dead - no bark	0.3	1.3	---	---	---	---	---	1.6
Total Hardwoods	0.9	3.4	---	---	---	---	---	4.3
CONIFERS								
Recent dead	---	0.3	0.7	---	---	---	---	1.0
Live - top broken out	---	---	0.7	---	---	---	---	0.7
Live - dead top	---	---	---	---	---	---	0.3	0.3
Older dead - bark tight	---	---	1.0	---	---	0.7	0.7	2.4
Older dead - no bark	---	1.3	1.7	0.7	0.7	0.7	---	5.1
Total Conifers	---	1.6	4.1	0.7	0.7	1.4	1.0	9.5
Total Snags	0.9	5.0	4.1	0.7	0.7	1.4	1.0	13.8

Table 33. Mean density of snags (stems/acre) in westside UMAs unattached to RMZs by snag class and size class (n = 6).

SNAG CLASS	SIZE CLASS (in)							
	< 4	4 - 7.9	8 - 11.9	12 - 15.9	16 - 19.9	20 - 23.9	> 24	TOTAL
HARDWOODS								
Recent dead	---	0.5	---	---	---	---	---	0.5
Live - top broken out	---	0.2	---	---	---	---	---	0.2
Live - dead top	0.3	0.3	0.4	---	---	---	---	1.0
Older dead - bark tight	1.0	1.1	0.5	---	---	---	---	2.6
Older dead - no bark	1.0	2.4	2.0	0.8	---	---	0.3	6.5
Total Hardwoods	2.3	4.5	2.9	0.8	---	---	0.3	10.8
CONIFERS								
Recent dead	1.3	1.2	2.0	0.1	---	0.1	0.1	4.8
Live - top broken out	---	0.6	0.1	0.1	0.1	---	0.1	1.0
Live - dead top	---	0.1	0.1	0.3	0.1	---	0.4	1.0
Older dead - bark tight	1.2	1.7	0.4	---	---	---	0.3	3.6
Older dead - no bark	1.0	2.0	0.6	0.4	0.3	0.3	0.5	5.1
Total Conifers	3.5	5.6	3.2	0.9	0.5	0.4	1.4	15.5
Total Snags	5.8	10.1	6.1	1.7	0.5	0.4	1.7	26.3

Table 34. Mean cover, constancy, and range of the dominant shrub in westside UMAs by position relative to RMZs (n = 8).

SHRUB	POSITION					
	Attached to RMZs			Unattached to RMZs		
	Cover	Const	Range	Cover	Const	Range
vine maple	61.7	27	3 - 98	59.1	29	3 - 98
serviceberry	-	-	-	89.6	4	63 - 98
Cascade Oregon grape	21.4	6	3 - 63	18.7	1	3 - 38
red-osier dogwood	87.4	11	38 - 98	-	-	-
hazelnut	57.3	8	3 - 98	73.7	8	3 - 98
salal	64.7	8	3 - 98	58.7	9	3 - 98
ocean spray	26.2	2	3 - 38	69.3	1	38 - 85
rusty menziesia	-	-	-	30.3	3	3 - 85
Indian plum	9.0	1	3 - 16	55.9	1	16 - 85
devil's club	-	-	-	70.3	1	63 - 85
pachistima	-	-	-	2.5	+	3 - 3
ninebark	81.5	3	16 - 98	85.0	+	85 - 85
cascara	-	-	-	39.3	+	16 - 63
prickly current	-	-	-	15.5	+	16 - 16
baldhip rose	2.5	1	3 - 3	-	-	-
rose species	2.5	1	3 - 3	-	-	-
salmonberry	19.8	10	3 - 63	45.5	10	3 - 98
thimbleberry	-	-	-	61.8	1	3 - 98
trailing blackberry	31.4	15	3 - 98	72.5	15	3 - 98
red elderberry	39.3	1	16 - 63	38.4	4	3 - 98
common snowberry	38.0	1	38 - 38	-	-	-
big huckleberry	-	-	-	12.6	2	3 - 38
red huckleberry	17.2	3	3 - 63	21.0	10	3 - 85
crabapple	-	-	-	91.5	+	85 - 98
Populus species	63.0	1	63 - 63	-	-	-
stink current	15.5	1	16 - 16	-	-	-

+ = rare

Table 35. Mean cover, constancy, and range of water, rock, soil, and organic ground cover (OGC) in UMAs by position relative to RMZs (n = 8).

VARIABLE	POSITION					
	Attached to RMZs			Unattached to RMZs		
	Cover	Const	Range	Cover	Const	Range
WESTSIDE						
Water	0.1	5	0 - 3	0.2	3	0 - 38
Rock	1.3	15	0 - 63	13.6	32	0 - 98
Soil	4.2	23	0 - 63	0.8	10	0 - 85
OGC	88.0	100	3 - 98	87.1	99	0 - 98

Table 36. Mean cover, constancy, and range of downed woody material > 4in. in diameter in UMAs by decay class and position relative to RMZs (n = 8).

DECAY CLASS	POSITION					
	Attached to RMZs			Unattached to RMZs		
	Cover	Const	Range	Cover	Const	Range
WESTSIDE						
1	0.5	7	0 - 16	1.0	11	0 - 63
2	1.4	15	0 - 38	1.7	19	0 - 38
3	3.1	28	0 - 38	3.5	26	0 - 63
Total	5.0	-	0 - 38	6.2	-	0 - 63

DISCUSSION AND RECOMMENDATIONS

site Selection

The proposal called for selecting sites harvested after January 1, 1988. Because these sites were scarce, we included sites harvested prior to 1988 that met the basic requirements of the revised forest practice regulations. 1988 sites were scarce because the lag time from harvest planning to harvest completion can be, and often is, very long. As a result, we concentrated on pre-1988 forest practices that met the 1988 requirements. These sites were included only after a discussion with the landowner concerning the needs of the project.

To facilitate future site selection, we recommend the following procedure:

First, determine whether the forest practice has been completed. The best method is to review the list of closed forest tax accounts. The list is available from the Department of Revenue (Appendix D).

Next, review the forest practice application to determine suitability for the study. This requires a visit to the DNR Regional office. For the best results contact the Forest Practice Administrative Assistant (Appendix D) by telephone first. The DNR retains active Forest Practices on file at the regional offices with maps of the harvest units attached. DNR may be willing to copy and forward requested forest practices. If not, a personal visit to the regional office may be required.

Finally, obtain permission from the landowner to audit the RMZ or UMA. The landowner can be quite helpful in identifying special features (e.g., road closures, etc.). Maps of haul roads are usually available from the large landowners. These maps are very helpful.

Sampling Methods

After using the field procedures for a season, we recommend several modifications. The Field Procedures Handbook (Washington Department of Wildlife, 1988) is an excellent first approximation to methods for data collection. The following minor changes should strengthen the reliability of the project:

Field forms - Currently the field forms are eight pages long - four two-sided cards. Appendix C shows how forms can be reduced to three two-sided cards by making the following changes:

I - combine Cards 1 and 1A to create a single two-sided card. Card 1 should be dedicated for general information only. This includes the RMZ/UMA profile map, notes, and photo point information. Because a unit map is attached to the forest practice application, a sketch map is not required.

Include space on Card 1 for stream name, initials of field crew, and UMA length. Delete field 10 (Harvest Unit Area Measured), fields 3 & 14 (UMA Area), field 20 (Perimeter), and field 21 (Area). These variables are almost impossible to measure accurately in the field and they can be derived.

Add a field to Card 1A for the LOD Transect Length Measured.

2 Combine cards 2 and 2A to create a second two-sided card containing information related to strip and tree variables. Also space for the crew’s initials, RZ Plant Association, Upland Plant Association, and field 59 (Final Subplot Length). (The last field is transferred from Card 3.) Change field 40 (D.B.H.) to Size Class (see Table 12 for size classes), and add a tally field.

3 - Combine Cards 3 and 3A to create a third two-sided card with information on shrubs, herbs, and other subplot variables. Add space for the crew’s initials, Strip Number, a second dominant shrub, two dominant herbs, and rootwads. Move field 59 (Final Subplot Length) to Card 2. Delete space allocated for seedlings and saplings. Record seedlings (trees at least one foot tall and less than 4.5 feet tall) in the shrub category. Tally saplings (trees 4.5 feet tall or taller and less than three inches in diameter) in the less-than-four-inch-diameter tree class. The result should allow for three subplot entries per side of each card.

4 - Attach an updated shrub and herb species list to each Tatum. Each crew member should possess a Rite In The Rain notebook to record tree size class information and other observations related to the RMZ or UMA.

Plot size - The size of the plot should be a function of the information required and the community sampled. Thus plot size should be large enough to capture reliable information about wildlife habitat and be easy to work with.

Table 37. Comparison of four methods for determining plot size limits designed to quantify forested plant associations

LAYER	PLOT SIZE LIMITS			
	Releve	Daubenmire	Current	Proposed

For a 25 foot wide RMZ the tree layer plot is currently about 1250 ft^2; the shrub layer is about 250 ft (Table 37). The literature suggests a wide range of size limits that depend on community homogeneity (Mueller-Dombois and Ellenberg, 1974). Size limits of about 1250 ft for the tree layer and 125 ft for the shrub layer are recommended. We therefore recommend that dimensions for the tree layer remain the same, but that plot size, shape, and configuration for the shrub/herb layer be changed (Figure 2). The proposed shrub/herb layer plot is a 5- X 10-ft rectangle. Advantages of this system are:

1 - Better cover estimates because it is easier to visualize cover using a 50 ft-rectangular plot than a 100 ft-square plot.

2 Increased data collection efficiency.

3 - Decreased trampling of herbaceous vegetation.

Tree measurements - Because this study was designed to characterize wildlife habitat, tree measurement information useful to wildlife managers are recommended. The current method calls for measuring trees to the nearest tenth of an inch. The proposed method would measure and classify trees by four-inch diameter classes. Advantages are:

1 Collect only data useful for wildlife management decisions.

2 - Increased data collection efficiency.

Plant Association Community Classification System

To draw inferences about wildlife use of RMZs and UMAs a reliable plant association classification system is needed. Without a solid classification system, inferences about wildlife use of RMZs and UMAs will be limited to individual sites. The system currently in use is the Natural Heritage Plan (Washington Natural Heritage Program, 1987). This classification system is inadequate with respect to classifying wildlife habitat.

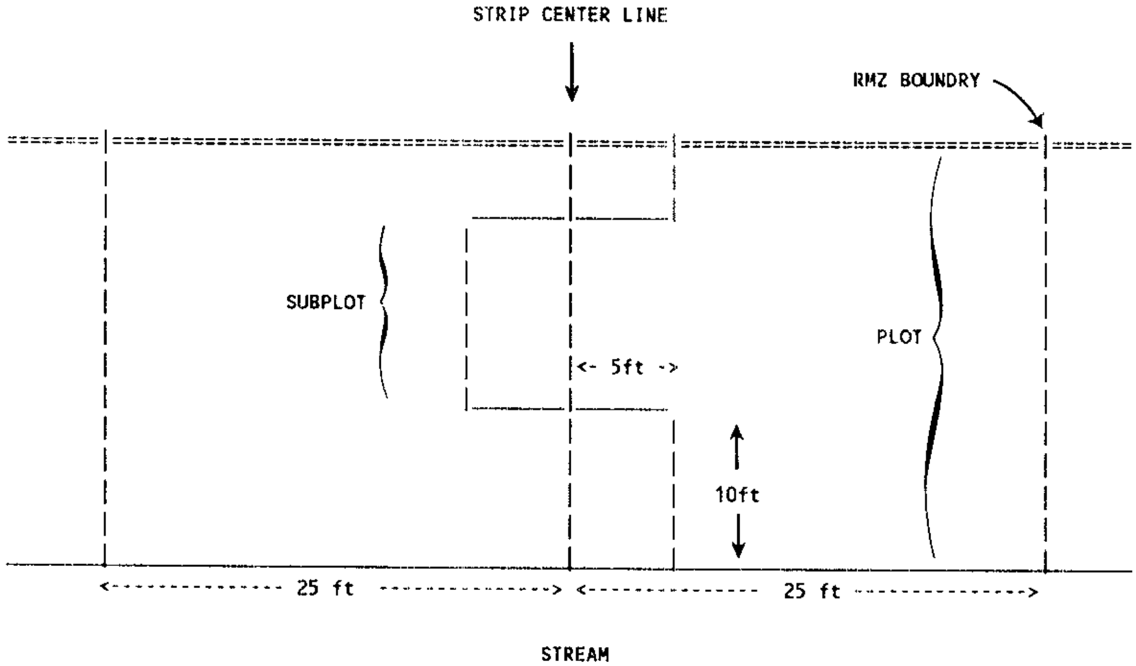

Figure 2. Proposed configuration of sample plot size, shape, and orientation of strip plots for RMZs and UMAs.

The Forest Service is in the process of classifying the forested plant associations of 'the National Forests of Washington (Williams and Lillybridge, 1983, Williams and Lillybridge, 1985, Topik et al., 1986, and Henderson et all., 1989). Apparently many of the RMZ and UMA plant communities sampled in this study can be classified using the Forest; Service system. Associations that can not be easily classified now may be classified later with the planned Forest Service riparian classification system (Henderson, per. comm.) if the data are collected in an appropriate manner.

The Forest Service classification system is recommended for this study. This will ;require collecting more detailed shrub and herb information. Specifically, cover estimates will be required for the two dominant shrubs and herbs. The current method only estimates cover for the dominant shrub. Because the sampling method often cuts across plant association boundaries, more than one plant association per strip may be encountered. The advantages of this system are:

1 - Describing RMZs and UMAs in terms that are useful to wildlife managers

- Dovetailing data collection techniques to fit with current Forest Service riparian classification projects.

The disadvantage is that this technique requires experienced field people capable of identifying shrubs and herbs by species. NOTE: The Forest Service has *some* easy-to-use field plant identification books available (Lesher and Henderson, 1986, Lesher and McClure, 1986, and Williams and Lillybridge, 1987).

Table 38, Mean riparian zone width (in feet) by water type (n = number of RMZs).

WATER TYPE								
1			2			3		
Mean	Range	n	Mean	Range	n	Mean	Range	n
4.9	0 - 41	5	4.4	0 - 25	8	11.0	0 - 40	18

_Riparian Zone Width

There was some confusion about measuring the riparian zone (RZ) width. In 1988, the RZ width was defined by the limits of obligate wetland plant species. As a result the RZ width was often narrow (Table 38). The recommended method defines the RZ width by plants that are frequently found in riparian areas, but not upland (dry) areas. Some of the more obvious plants are:

Cornus stolonifera	red-osier dogwood
Fraxinus latifolia	Oregon ash
Oplopanax horidum	devil's club
populus trichocarpa	black cottonwood
Ribes lacustre	prickly current
Rubus spectabilis	salmonberry
Spirea douglasii	hardhack
Athyrium filix-femina	ladyfern
Lysichitum americanum	skunk cabbage
Senicio triangularis	arrowleaf groundsel

CONCLUSIONS

The purpose of this project was to quantify the physical and botanical characteristics of RMZs and UMAs with respect to wildlife habitat. However, some of the information may be of value to managers of other resources. Because the purpose of the project was to quantify RMZs and UMAs with respect to wildlife habitat, only information required to make wildlife management recommendations should be quantified.

Specific conclusions regarding the physical and botanical characteristics of RMZs and UMAs were not possible at this time because of the small sample size. In general, however, RMZs were wider than the forest practice regulations specify. They were dominated by trees with diameters less than 12 inches. RMZs were dominated by hardwoods on Type 1 and 2 waters and by conifers on Type 3 waters. Shrubs dominated the understory of all RMZs.

In general UMAs were located on ground economically prohibitive to harvest. Like RMZs, they were dominated by trees with diameters less than 12 inches. UMAs attached to RMZs were dominated by hardwoods and UMAs unattached to RMZs were dominated by a mixture of hardwoods and conifers. Shrubs dominated the understory of UMAs.

The study plan was an excellent first approximation of the methods for data collection. Some minor changes should strengthen the reliability of the results. The recommended changes are:

1 - change the area of subplots from 250 ft^2 to 125 ft^2.

2 - incorporate the Forest Service plant association community classification system.

3 use four-inch diameter classes to quantify trees and snags.

include seedlings as shrubs in the subplots and saplings in the smallest tree size class.

5 quantify the two dominant shrubs and herbs.

6 - quantify rootwad coverage :in addition to downed logs.

classify UMAs in such a way that they are easily visualized (e.go, forested wetland, scree slope, etc.).

ACKNOWLEDGMENTS

The success of this project can be attributed to the cooperative efforts of many people. An entire chapter would be necessary to acknowledge every person who helped. A few key people, however, should be recognized by name for their efforts: Rollie Geppert for providing leadership; the TFW Wildlife Steering Committee for developing the sampling methods; Peter Haug for designing the field data collection forms and editing the field manual and this report; Steve Sherlock for coordinating the WCC program; and most important, many thanks to Lori Braun, Amy Cook, and Matt Green for their attention to detail in the field.

LITERATURE CITED

Franklin, J. F. and C. T. Dyrness. 1973. Natural vegetation of Oregon and Washington. USDA For. Serv., Gen. Tech. Rep. PNW-8, 417p. PNW For. and Range Exp. Stn., Portland, OR

Henderson, J. A., D. H. Peter, R. D. Lesher, and D. C. Shaw. 1989. Forested plant associations of the Olympic National Forest. USDA For. Serv., Rep. No. R6-E-TP-001-88, 501p. PNW Region, Portland, OR

Lesher, R. and J. A. Henderson. 1986. A guide to the indicator species of the Olympic and Mt. Baker-Snoqualmie National Forests. USDA For. Serv., 48p.

Lesher, R. and R. H. McClure. 1986. Major indicator shrubs and herbs on national forests of Western Oregon and Southwestern Washington. USDA For. Serv. R6-TM-229-1986, PNW Region, Portland,OR.

Meuller-Dubois, D. and H. Ellenberg. 1974. Aims and methods of vegetation ecology. 547p. John Wiley & Sons, Inc., New York.

Smartware. 1986. Innovative Software Inc., Lenexa, KS.

Thomas, J. W., C. Maser, and J. E. Rodiek. 1979. Riparian zones. In J. W. Thomas (ed.) Wildlife habitats in managed forests: The Blue Mountains of Oregon and Washington. USDA For. Serv. Agric. Handbook No. 553, p. 40-47. U. S. Govt. Print. Office, Washington D.C.

Timber/Fish/Wildlife Agreement. 1987. A better future for our woods and streams - final report., 57p.

Topik, C., N. M. Halverson, and D. G. Brockway. 1986. Plant association and management guide for the western hemlock zone: Gifford Pinchot National Forest. USDA For. Serv. R6-Ecol-230B-1986, 84p. PNW Region, Portland, OR.

Washington Department of Wildlife. 1988. Field procedures handbook - characterization of riparian management zones and upland management areas with respect to wildlife habitat., 15p.

Washington Natural Heritage Program. 1987. State of Washington Natural Heritage Plan. WA Dept. Natural Resources, 102p. Olympia,WA.

Washington State Forest Practices Board. 1988. Washington forest practices rules and regulations., 139p.

williams, C. K. and T. R. Lillybridge. 1983. Forested plant associations of the Okanogan National Forest. USDA For. Serv. Rep. No. R6-Ecol-132b-1983, l16p. PNW Region, Portland, OR.

Williams, C. K. and T. R. Lillybridge. 1985. Draft forested plant associations of the Colville National Forest. USDA For. Serv., 96p. PNW Region, Portland,OR.

williams, C. K. and T. R. Lillybridge. 1987. Major indicator shrubs and herbs on national forests of eastern Washington. USDA For. Serv. R6-TM-TP-304-87, PNW Region, Portland, OR.

APPENDIX A

LIST OF ABBREVIATIONS
SCIENTIFIC AND COMMON NAMES OF
TREES AND SHRUBS

TREES

CODE	SCIENTIFIC NAME	COMMON NAME
ABAM	Abies amabilis	Pacific silver fir
ABGR	Abies grandis	grand fir
ABLA2	Abies lasiocarpa	subalpine fir
ABPR	Abies procera	noble fir
ACMA	Acer macrophyllum	bigleaf maple
ALRU	Alnus rubra	red alder
ARME	Arbutus menziesii	Pacific madrone
FRLA	Fraxinus latifolia	Oregon ash
LAOC	Larix occidentalis	western larch
PISI	Picea sitchensis	Sitka sprue
PICO	Pinus contorta	lodgepole pine
PIPO	Pinus ponderosa	ponderosa pine
PIMO	Pinus monticola	western white pine
POTR	Populus tremuloides	quaking aspen
POTR2	Populus trichocarpa	black cottonwood
PREM	Prunus emarginata	bitter cherry
PSME	Pseudotsuga menziesii	Douglas-fir
PYFU	Pyrus fusca	crabapple
TABE	Taxus brevifolia	Pacific yew
THPL	Thuja plicata	western red cedar
TSHE	Tsuga heterophylla	western hemlock
TSME	Tsuga mertensiana	mountain hemlock

SHRUBS

CODE	SCIENTIFIC NAME	COMMON NAME
ACCI	*Acer circinatum*	vine maple
ACGLD	*Acer glabrum* var. *douglasii*	Douglas maple
ALSPP	*Alnus spp.*	Alder species
ALSI	*Alnus sinuata*	Sitka alder
AMAL	*Amalanchier alnifolia*	serviceberry
ARUV	*Arctostaphylos uva-ursi*	bearberry
BENE	*Berberis nervosa*	Cascade Ore grape
BERE	*Berberis repens*	Oregon grape
COST	*Cornus stolonifera*	red-osier dogwood
COCO2	*Corylus cornuta*	hazelnut
GASH	*Gaultheria shallon*	salal
HODI	*Holodiscus discolor*	ocean-spray
MEFE	*Menziesia ferruginea*	rusty menziesia
OECE	*Oemleria cerasiformis*	Indian plum
OPHO	*Oplopanax horridum*	devil's club
PAMY	*Pachistima myrsinities*	pachistima
PHMA	*Physocarpus malvaceus*	ninebark
RHPU	*Rhamnus purshiana*	cascara
RICE	*Ribes cereum*	wax current
RILA	*Ribes lacustre*	prickly current
ROGY	*Rosa gymnocarpa*	baldhip rose
ROSSP	*Rosa spp.*	rose species
RUPA	*Rubus parviflorus*	westrn thimbleberry
RUSP	*Rubus spectabilis*	salmonberry
RUUR	*Rubus ursinus*	trailing blackberry
SASPP	*Salix spp.*	Willow species
SASC	*Salix scouleriana*	Scouler willow
SARA	*Sambucus racemosa*	red elderberry
SOSC2	*Sorbus scopulina*	mountain ash
SPBEL	*Spirea betulifolia* var. *lucinda*	shiny leaf spirea
SPDO	*Spirea douglasii*	hardhack
SYAL	*Symphoricarpos albus*	common snowberry
VACCI	*Vaccinium spp.*	huckleberry species
VAME	*Vaccinium membranaceum*	big huckleberry
VAPA	*Vaccinium parvifolium*	red huckleberry
VASC	*Vaccinium scoparium*	grouse huckleberry

APPENDIX B

SUPPORTING TABLES

Table 39. Slope aspect of RMZs by water type (n = number of RMZs).

LOCATION	WATER TYPE					
	1		2		3	
	Range	n	Range	n	Range	n
WESTSIDE	all	5	all	6	all	16
EASTSIDE	-	-	N-E & S-NW	2	all	2

Table 40. Mean elevation (in feet) of RMZs by water type (n = number of RMZs).

LOCATION	WATER TYPE								
	1			2			3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
WESTSIDE	400	0 - 900	5	800	200 - 2400	6	1100	100 - 4700	16
EASTSIDE	-	-	-	2600	2500 - 2700	2	2800	2300 - 3200	2

Table 41. Mean distance (in feet) to the nearest road and the perimeter-area ratio of RMZs by water type (n = number of RMZs).

VARIABLE	WATER TYPE								
	1			2			3		
	Mean	Range	n	Mean	Range	n	Mean	Range	n
Distance to nearest road	580	0 - 1300	5	184	0 - 600	8	129	0 - 600	18
Perimeter-area ratio	0.1	0.0 - 0.1	5	0.1	0.0 - 0.2	8	0.1	0.0 - 0.1	18

Table 42. Distribution (in percent) of stream substrate by water type (n = 31).

WATER TYPE 1		2		3	
Substrate		Substrate		Substrate	
Gravel/Cobble	Boulder/Bedrock	Gravel/Cobble	Boulder/Bedrock	Gravel/Cobble	Boulder/Bedrock
6	10	23	3	48	10

Table 43. Slope aspect of UMAs by position relative to RMZs (n = number of UMAs).

LOCATION	POSITION Attached to RMZs		Unattached to RMZs	
	Range	n	Range	n
WESTSIDE	N-SW & NW	2	all	6

Table 44. Mean elevation (in feet) of UMAs by position relative to RMZs (n = number of UMAs).

LOCATION	POSITION Attached			Unattached		
	Mean	Range	n	Mean	Range	n
WESTSIDE	1200	0 - 2400	2	1100	500 - 2900	6

Table 45. Mean distance (in feet) to the nearest water and road, and the perimeter-area ratio of UMAs relative to RMZs (n = number of UMAs).

VARIABLE	POSITION Attached to RMZs			Unattached to RMZs		
	Mean	Range	n	Mean	Range	n
Distance to nearest water	50.0	-	2	412.5	0 - 2000	6
Distance to nearest road	211.5	0 - 425	2	133.3	0 - 500	6
Perimeter-area-ratio	0.03	0.02 - 0.03	2	0.02	0.02 - 0.03	6

APPENDIX C

Revised Field Forms

CARD 1A -- RMZ/UMA LOCATION, GENERAL INFORMATION

RMZ/UMA |_|_|_| (number) 3 FPA |_|_|_|_|_|_|_| (number) 2 Date |_|_|_|_|_|_| (Y Y M M D D) 1 pg __ of___

Landowner |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| 4

Field Crew |_|_|_|_| |_|_|_|_|

Location T|_|_|R|_|_|_|S|_|_| 6 Elevation |_|_| 5 (100s of ft)

Stream |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| 25 Type |_| 26 Stream Substrate |_| 8

Sizes	From FPA	Measured
Harvest Unit area (acres)	|_|_|_|_|_| 9	|_|_|_|_|_| 10
RMZ length (feet)		|_|_|_|_|_| 12
UMA length measured (feet)		|_|_|_| 14

Distances (ft) to nearest:

Road |_|_|_|_| 15 Water |_|_|_|_| 16 Type |_| 17 Vegetation |_|_|_|_| 18 Type |_|_| 19

RMZ Profile (Downstream view)

Remarks: ____________________________

Photo	Location
1 - 4	Strip # ________
5	Strip # ________
6	Strip # ________

CARD 1B -- RMZ/UMA LOD

RMZ/UMA (3) |_|_|_| (number)   FPA (2) |_|_|_|_|_|_|_| (number)   Date (1) |_|_|_|_|_|_| (Y Y M M D D)   pg __ of ___

Large Organic Debris (LOD)

Length	Diameter	Type	Length	Diameter	Type	Length	Diameter	Type
22	23	24	22	23	24	22	23	24
X | Y			X | Y			X | Y		
							50 PIECES	
(ft)	(in)		(ft)	(in)		(ft)	(in)	

CARD 2A -- STRIP PLOT DATA

RMZ/UMA |_|_|_| 3 (number)   FPA |_|_|_|_|_|_|_| 2 (number)   Date |_|_|_|_|_|_| 1 (Y Y M M D D)   pg __ of ___

Stream |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| 25   Type |_| 26   Dir. |_|_|_| 27 (degrees)   Strip |_|_|_| 28 (number)

Canopy |_|_| Width |_|_|_| Depth |_|.|_| Gradient |_|_|_   RZ Width |_|_|_|

Strip azimuth |_|_|_| 34 (degrees)   Slope |_|_|_| 35 (%)   Slope aspect |_| 36   Topographic site |_| 37

Rz Plant Association |_|_|_|_|/|_|_|_|_| Final Subplot Length |_| 59

Upland Plant Association |_|_|_|_|/|_|_|_|_| Field Crew |_|_|_|_| |_|_|_|_

-------------------------------- TREE DATA --------------------------------

Size Classes: <4   4 - 7.9   8 - 11.9   12 - 15.9   16 - 19.9   20 - 23.9   >24

Class 38	Species 39	Size Class 40	Total	Class 38	Species 39	Size Class 40	Total
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|
|_|	|_|_|_|	|_|	|_|	|_|	|_|_|_|	|_|	|_|

CARD 2B -- STRIP PLOT TREE DATA (continued)

RMZ/UMA |_|_|_| 3 (number)   FPA |_|_|_|_|_|_|_| 2 (number)   Date |_|_|_|_|_|_| 1 (Y Y M M D D)   pg __ of ___

Strip |_|_|_| 28 (number)

TREE DATA

Size Classes: ≤4   4 - 7.9   8 - 11.9   12 - 15.9   16 - 19.9   20 - 23.9   ≥24

Class 38	Species 39	Size Class 40	Total	Class 38	Species 39	Size Class 40	Total

CARD 3A -- SUBPLOT DATA

RMZ/UMA |_|_|_| FPA |_|_|_|_|_|_|_| Date |_|_|_|_|_|_| pg __ of ___

3 (number) 2 (number) 1 (Y Y M M D D)

==

Strip |_|_|_| Subplot |_|_| Canopy |_|_| Field Crew |_|_|_|_| |_|_|_|_|
28 41 4

Cover Codes: 1=trace-5% 2=6-25% 3=26-50% 4=51-75% 5=76-95% 6=96-100%

Dominant Shrub |_|_|_|_|_| DomShrub |_| Shrubs |_| Forbs |_| Graminoids |_|
44 45 46 47 48

Dominant Shrub |_|_|_|_|_| DomShrub |_| DW1 |_| DW2 |_| DW3 |_|
44 45 49 50 51

Dominant Herb |_|_|_|_|_| DomHerb |_| Water |_| Rock |_|
53 54

Dominant Herb |_|_|_|_|_| DomHerb |_| Soil |_| OGC |_|
55 52

==

Strip |_|_|_| Subplot |_|_| Canopy |_|_| Field Crew |_|_|_|_| |_|_|_|_|
28 41 43

Cover Codes: 1=trace-5% 2=6-25% 3=26-50% 4=51-75% 5=76-95% 6=96-1600%

Dominant Shrub |_|_|_|_|_| DomShrub |_| Shrubs |_| Forbs |_| Graminoids |_|
44 45 46 47 48

Dominant Shrub |_|_|_|_|_| DomShrub |_| DW1 |_| DW2 |_| DW3 |_|
44 45 49 50 51

Dominant Herb |_|_|_|_|_| DomHerb |_| Water |_| Rock |_|
53 54

Dominant Herb |_|_|_|_|_| DomHerb |_| Soil |_| OGC |_|
55 52

==

Strip |_|_|_| Subplot |_|_| Canopy |_|_| Field Crew |_|_|_|_| |_|_|_|_|
28 41 43

Cover Codes: 1=trace-5% 2=6-25% 3=26-50% 4=51-75% 5=76-95% 6=96-1600%

Dominant Shrub |_|_|_|_|_| DomShrub |_| Shrubs |_| Forbs |_| Graminoids |_|
44 45 46 47 48

Dominant Shrub |_|_|_|_|_| DomShrub |_| DW1 |_| DW2 |_| DW3 |_|
44 45 49 50 51

Dominant Herb |_|_|_|_|_| DomHerb |_| Water |_| Rock |_|
53 54

Dominant Herb |_|_|_|_|_| DomHerb |_| Soil |_| OGC |_|
55 52

CARD 3B -- SUBPLOT DATA (continued)

RMZ/UMA |_|_|_| 3 (number)   FPA |_|_|_|_|_|_|_| 2 (number)   Date |_|_|_|_|_|_| 1 (Y Y M M D D)   pg __ of ___

==

Strip |_|_|_| 28   Subplot |_|_| 41   Canopy |_|_| 43   Field Crew |_|_|_|_| |_|_|_|_|

Cover Codes: 1=trace-5%   2=6-25%   3=26-50%   4=51-75%   5=76-95%   6=96-100%

Dominant Shrub |_|_|_|_|_| 44   DomShrub |_| 45   Shrubs |_| 46   Forbs |_| 47   Graminoids |_| 48

Dominant Shrub |_|_|_|_|_| 44   DomShrub |_| 45   DW1 |_| 49   DW2 |_| 50   DW3 |_| 51

Dominant Herb |_|_|_|_|_| DomHerb |_| Water |_| 53   Rock |_| 54

Dominant Herb |_|_|_|_|_| DomHerb |_| Soil |_| 55   OGC |_| 52

==

Strip |_|_|_| 28   Subplot |_|_| 41   Canopy |_|_| 43   Field Crew |_|_|_|_| |_|_|_|_|

Cover Codes: 1=trace-5%   2=6-25%   3=26-50%   4=51-75%   5=76-95%   6=96-1600%

Dominant Shrub |_|_|_|_|_| 44   DomShrub |_| 45   Shrubs |_| 46   Forbs |_| 47   Graminoids |_| 48

Dominant Shrub |_|_|_|_|_| 44   DomShrub |_| 45   DW1 |_| 49   DW2 |_| 50   DW3 |_| 51

Dominant Herb |_|_|_|_|_| DomHerb |_| Water |_| 53   Rock |_| 54

Dominant Herb |_|_|_|_|_| DomHerb |_| Soil |_| 55   OGC |_| 52

==

Strip |_|_|_| 28   Subplot |_|_| 41   Canopy |_|_| 43   Field Crew |_|_|_|_| |_|_|_|_|

Cover Codes: 1=trace-5%   2=6-25%   3=26-50%   4=51-75%   5=76-95%   6=96-1600%

Dominant Shrub |_|_|_|_|_| 44   DomShrub |_| 45   Shrubs |_| 46   Forbs |_| 47   Graminoids |_| 48

Dominant Shrub |_|_|_|_|_| 44   DomShrub |_| 45   DW1 |_| 49   DW2 |_| 50   DW3 |_| 51

Dominant Herb |_|_|_|_|_| DomHerb |_| Water |_| 53   Rock |_| 54

Dominant Herb |_|_|_|_|_| DomHerb |_| Soil |_| 55   OGC |_| 52

APPENDIX D

KEY CONTACTS:
SOURCE FOR FOREST PRACTICE
INFORMATION

DNR

REGION	NAME	TITLE	TELEPHONE
CEN	John Baarspul	FP Regional Coordinator	(206) 753-3410
CEN	Debie Boyd	FP Admin Asst	(206) 753-3410
NE	Bob Anderson	FP Regional Coordinator	(509) 684-5201
NE	Diana Hoffman	FP Admin Asst	(509) 684-5201
NW	Dick Skvorak	FP Regional Coordinator	(206) 856-0083
NW	Diane Paustain	FP Admin Asst	(206) 856-0083
OLY	Jack Zaccardo	FP Regional Coordinator	(206) 374-6131
OLY	Jackie Simmons	FP Admin Asst	(206) 374-6131
SPS	Don Theoe	FP Regional Coordinator	(206) 825-1631
SPS	Diane Andersen	FP Admin Asst	(206) 825-1631
SE	Ben Startt	FP Regional Coordinator	(509) 925-6131
SE	Linda Hazlett	FP Admin Asst	(509) 925-6131
SW	Llyod Handlos	FP Regional Coordinator	(206) 577-2025
SW	Shirley Shea	FP Admin Asst	(206) 577-2025

WEYERHAEUSER

REGION	NAME	TITLE	TELEPHONE
CEN	John Helm	Area Forester	(206) 748-8661
CEN	Tim Shere	District Engineer	(206) 942-2442

[redacted]

OTHER INDUSTRY

REGION	NAME	COMPANY	TELEPHONE
CEN	Al Cain	Campbell Group	(206) 532-7331
CEN	John Ensinger	Menesha	(206) 754-1711
NE	Steve Tveit	Boise Cascade	(509) 738-6421
NE	Wayne Vaagen	Vaagen Bros.	(509) 684-5071
NW	Dave Chaimberlain	Georgia Pacific	(206) 733-4410
NW	Pete Poeschol	Poeschol & Schultz	(206) 659-5666
NW	Ernie White	Scott Paper	(206) 826-3951
OLY	Mike Piotrowski	ITT Rayonier	(206) 374-6565
SPS	Craig Beals	Champion International	(206) 879-5311
SPS	Rod Maki	Pope & Talbot	(206) 297-3341
SPS	Dave Baxtrum	Simpson Timber	(206) 426-3381
SE	Bill Howard	Boise Cascade	(509) 453-3131
SW	Marc Norberg	International Paper	(206) 423-2110
SW	Monte Martinsen	Longview Fibre	(206) 425-1550

DEPARTMENT OF WILDLIFE

REGION	NAME	TITLE	TELEPHONE
I	John Whalen	TFW Biologist	(509) 456-4082
II	John Rohrer	TFW Biologist	(509) 754-4624
III	John Mankowski	TFW Biologist	(509) 575-2740
IV	[illegible]	[illegible]	[illegible]
V	Bob Bicknell	TFW Biologist	(206) 274-9814
VI	Gloria Mitchell	TFW Biologist	(206) 753-2600
HQ	Chad Armour	TFW Biologist	(206) 753-3318
HQ	Rollie Geppert	TFW Program Manager	(206) 753-3318
HQ	Pete Haug	Systems Biologist	(206) 753-3318

DEPARTMENT OF REVENUE